TEST PAPER OF JEE(MAIN) EXAMINATION – 2019

(Held On Friday 11th JANUARY, 2019) TIME : 9 : 30 AM To 12 : 30 PM

CHEMISTRY

1. For the cell Zn(s) | Zn^{2+}(aq) || M^{x+} (aq) | M(s), different half cells and their standard electrode potentials are given below :

M^{x+}(aq/M(s)	Au^{3+}(aq)/ Au(s)	Ag^{+}(aq)/ Ag(s)	Fe^{3+}(aq)/ Fe^{2+}(aq)	Fe^{2+}(aq)/ Fe(s)
$E^{o}_{M^{x+}/M^{(v)}}$	1.40	0.80	0.77	–0.44

If $E^{o}_{Zn^{2+}/Zn} = -0.76\,V$, which cathode will give a mxximum value of E^{o}_{cell} per electron transferred ?

(1) Fe^{3+} / Fe^{2+} (2) Ag^{+} / Ag

(3) Au^{3+} / Au (4) Fe^{2+} / Fe

Ans. (2)

2. The correct match between items-I and II is :

Item-I ***(Mixture)***	***Item-II*** ***(Separation method)***
(A) H_2O : Sugar	(P) Sublimation
(B) H_2O : Aniline	(Q) Recrystallization
(C) H_2O : Toluene	(R) Steam distillation
	(S) Differential extraction

(1) A-Q, B-R, C-S (2) A-R, B-P, C-S

(3) A-S, B-R, C-P (4) A-Q, B-R, C-P

Ans. (1)

Sol. **(Mixture)** **(Seperation method)**

H_2O : Sugar $\Rightarrow$ Recrystallization

H_20 : Aniline $\Rightarrow$ Steam distillation

H_2O : Toluene $\Rightarrow$ Differential extraction

3. If a reaction follows the Arrhenius equation, the plot lnk vs $\frac{1}{(RT)}$ gives straight line with a gradient (–y) unit. The energy required to activate the reactant is :

(1) y unit (2) –y unit

(3) yR unit (4) y/R unit

Ans. (1)

4. The concentration of dissolved oxygen (DO) in cold water can go upto :

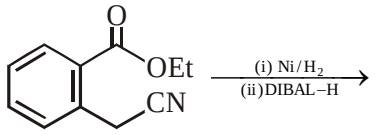
(1) 10 ppm (2) 14 ppm

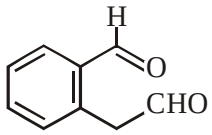
(3) 16 ppm (4) 8 ppm

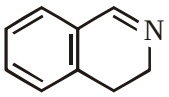
Ans. (1)

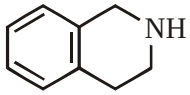
Sol. In cold water, dissolved oxygen (DO) can reach a concentration upto 10 ppm

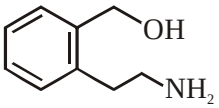
5. The major product of the following reaction is:



(1) 

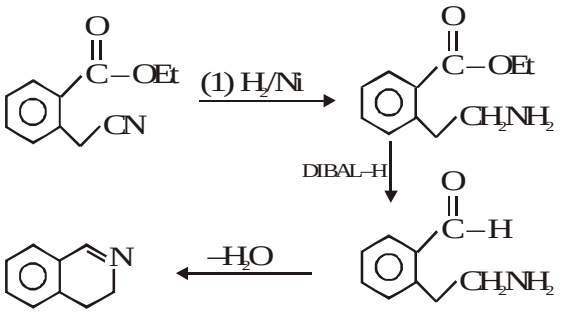
(2) 

(3) 

(4) 

Ans. (2)

Sol.



6. Th correct statements among (a) to (d) regarding H_2 as a fuel are :

(a) It produces less pollutant than petrol

(b) A cylinder of compressed dihydrogen weighs ~ 30 times more than a petrol tank producing the same amount of energy

(c) Dihydrogen is stored in tanks of metal alloys like $NaNi_5$

(d) On combustion, values of energy released per gram of liquid dihydrogen and LPG are 50 and 142 kJ, respectively

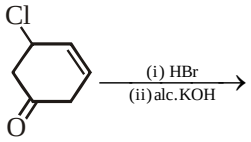
(1) b and d only (2) a, b and c only

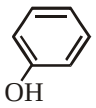
(3) b, c and d only (4) a and c only

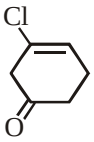
Ans. (2)

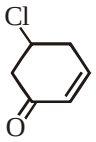
Sol. Option (a), (b) & (c) are correct answer (NCERT THEORY BASED)

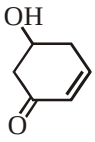
7. The major poduct of the following reaction is:



(1) 

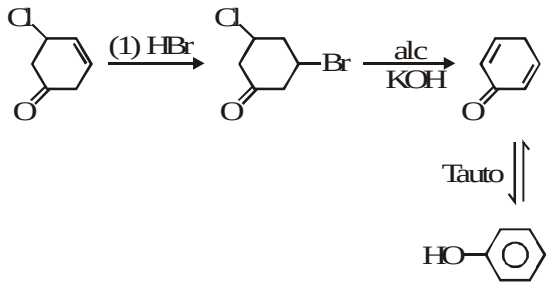
(2) 

(3) 

(4) 

Ans. (1)

Sol.



8. The element that usually does not show variable oxidation states is :

(1) V (2) Ti (3) Sc (4) Cu

Ans. (3)

Sol. Usally Sc(Scandium) does not show variable oxidation states.

Most common oxidation states of :

(i) Sc : +3

(ii) V : +2, +3, +4, +5

(iii) Ti : +2, +3, +4

(iv) Cu : +1, +2

9. An organic compound is estimated through Dumus method and was found to evolve 6 moles of CO_2. 4 moles of H_2O and 1 mole of nitrogen gas. The formula of the compound is :

(1) $C_{12}H_8N$ (2) $C_{12}H_8N_2$

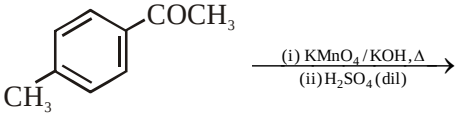
(3) C_6H_8N (4) $C_6H_8N_2$

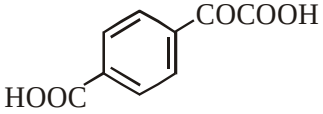
Ans. (4)

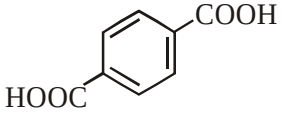
Sol. $[C_xH_yN_z] \xrightarrow[\text{Method}]{\text{Duma}} 6CO_2 + 4H_2O + N_2$

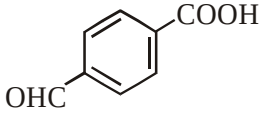
Hence, $C_6H_8N_2$

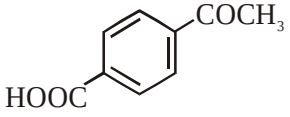
10. The major product of the following reaction is :



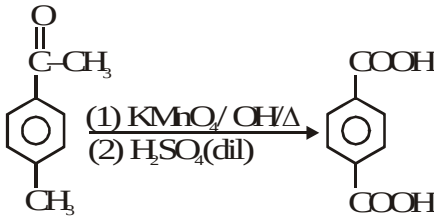
(1) 

(2) 

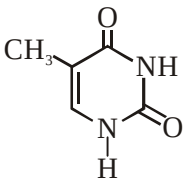
(3) 

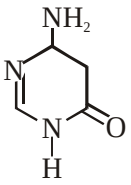
(4) 

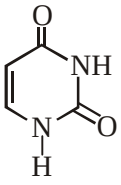
Ans. (2)

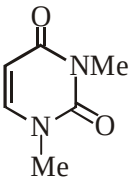
Sol. 

11. Among the following compound which one is found in RNA ?

(1) 

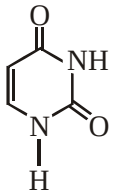
(2) 

(3) 

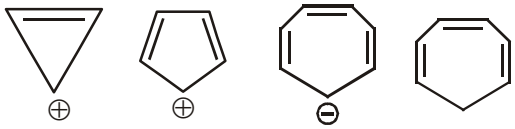
(4) 

Ans. (3)

Sol. For the given structure 'uracil' is found in RNA



12. Which compound(s) out of the following is/are not aromatic ?



(A) (B) (C) (D)

(1) C and D (2) B, C and D

(3) A and C (4) B

Ans. (2)

Sol. out of the given options only  is aromatic.

Hence (B), (C) and (D) are not aromatic

13. The correct match between Item(I) and Item(II) is :

Item-I	**Item-II**
(A) Nortehindrone	(P) Anti-biotic
(B) Ofloxacin	(Q) Anti-fertility
(C) Equanil	(R) Hypertension
	(S) Analgesics

(1) A-R, B-P, C-S (2) A-Q, B-P, C-R

(3) A-R, B-P, C-R (4) A-Q, B-R, C-S

Ans. (2)

Sol. (A) Norethindrone – Antifertility

(B) Ofloaxacin – Anti-Biotic

(C) Equanil – Hypertension (traiquilizer)

14. Heat treatment of muscular pain involves radiation of wavelength of about 900 nm. Which spectral line of H-atom is suitable for this purpose ?

[$R_H = 1 \times 10^5\ cm^{-1}$, $h = 6.6 \times 10^{-34}$ Js, $c = 3 \times 10^8\ ms^{-1}$]

(1) Paschen, $5 \rightarrow 3$ (2) Paschen, $\infty \rightarrow 3$

(3) Lyman, $\infty \rightarrow 1$ (4) Balmer, $\infty \rightarrow 2$

Ans. (2)

15. Consider the reaction,

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

The equilibrium constant of the above reaction is K_P. If pure ammonia is left to dissociate, the partial pressure of ammonia at equilibrium is given by (Assume that $P_{NH_3} << P_{total}$ at equilibrium)

(1) $\frac{3^{\frac{3}{2}} K_P^{\frac{1}{2}} P^2}{4}$ (2) $\frac{3^{\frac{3}{2}} K_P^{\frac{1}{2}} P^2}{16}$

(3) $\frac{K_P^{\frac{1}{2}} P^2}{16}$ (4) $\frac{K_P^{\frac{1}{2}} P^2}{4}$

Ans. (2)

16. Match the ores(Column A) with the metals (column B) :

Column-A ***Ores***	***Column-B*** ***Metals***
(I) Siderite	(a) Zinc
(II) Kaolinite	(b) Copper
(III) Malachite	(c) Iron
(IV) Calamine	(d) Aluminium

(1) I-b ; II-c ; III-d ; IV-a

(2) I-c ; II-d ; III-a ; IV-b

(3) I-c ; II-d ; III-b ; IV-a

(4) I-a ; II-b ; III-c ; IV-d

Ans. (3)

Sol. Siderite : $FeCO_3$

Kaolinite : $Al_2(OH)_4Si_2O_5$

Malachite : $Cu(OH)_2.CuCO_3$

Calamine : $ZnCO_3$

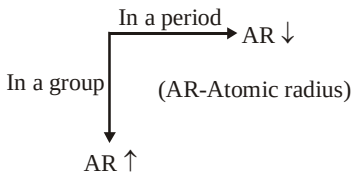
17. The correct order of the atomic radii of C, Cs, Al and S is :

(1) S < C < Al < Cs (2) S < C < Cs < Al

(3) C < S < Cs < Al (4) C < S < Al < Cs

Ans. (4)

Sol.



Atomic radii order : C < S < Al < Cs

Atomic radius of C : 170 pm

Atomic radius of S : 180 pm

Atomic radius of Al : 184 pm

Atomic radius of Cs : 300 pm

18. Match the metals (Column I) with the coordination compound(s) / enzyme(s) (Column II)

Column-I	*Column-II*
Metals	*Coordination compound(s) / Enzyme(s)*
(A) Co	(i) Wilkinson catalyst
(B) Zn	(ii) Chlorophyll
(C) Rh	(iii) Vitamin B_{12}
(D) Mg	(iv) Carbonic anhydrase

(1) A-ii ; B-i ; C-iv ; D-iii

(2) A-iii ; B-iv ; C-i ; D-ii

(3) A-iv ; B-iii ; C-i ; D-ii

(4) A-i ; B-ii ; C-iii ; D-iv

Ans. (2)

Sol. (i) Wilkinson catalyst : $RhCl(PPh_3)_3$

(ii) Chlorophyll : $C_{55}H_{72}O_5N_4Mg$

(iii) Vitamin B_{12}(also known as cyanocobalamin) contain cobalt.

(iv) Carbonic anhydrase contains a zinc ion.

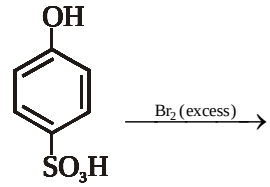
19. A 10 mg effervescent tablet contianing sodium bicarbonate and oxalic acid releases 0.25 ml of CO_2 at T = 298.15 K and p = 1 bar. If molar volume of CO_2 is 25.0 L under such condition, what is the percentage of sodium bicarbonate in each tablet ? [Molar mass of $NaHCO_3$ = 84 g mol^{-1}]

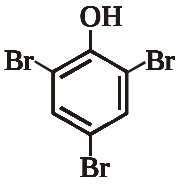
(1) 16.8 (2) 8.4

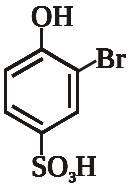
(3) 0.84 (4) 33.6

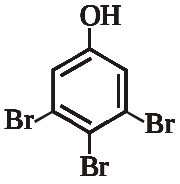
Ans. (1)

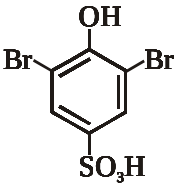
20. The major product of the following reaction is :



(1) 

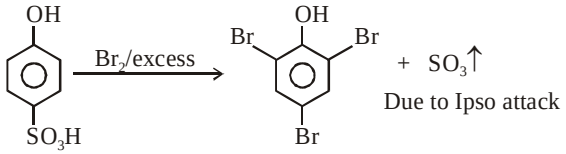
(2) 

(3) 

(4) 

Ans. (1)

Sol.



21. Two blocks of the same metal having same mass and at temperature T_1 and T_2, respectively. are brought in contact with each other and allowed to attain thermal equilibrium at constant pressure. The change in entropy, ΔS, for this process is :

(1) $2C_p \ln\left(\frac{T_1+T_2}{4T_1T_2}\right)$ (2) $2C_p \ln\left[\frac{(T_1+T_2)^{\frac{1}{2}}}{T_1T_2}\right]$

(3) $C_p \ln\left[\frac{(T_1+T_2)^2}{4T_1T_2}\right]$ (4) $2C_p \ln\left[\frac{T_1+T_2}{2T_1T_2}\right]$

Ans. (3)

22. The chloride that CANNOT get hydrolysed is :

(1) $SiCl_4$ (2) $SnCl_4$

(3) $PbCl_4$ (4) CCl_4

Ans. (4)

Sol. CCl_4 cannot get hydrolyzed due to the absence of vacant orbital at carbon atom.

23. For the chemical reaction $X \rightleftharpoons Y$, the standard reaction Gibbs energy depends on temperature T (in K) as :

$$\Delta_r G^o \text{ (in kJ mol}^{-1}) = 120 - \frac{3}{8}T$$

The major component of the reaction mixture at T is :

(1) X if T = 315 K

(2) X if T = 350 K

(3) Y if T = 300 K

(4) Y if T = 280 K

Ans. (1)

24. The freezing point of a diluted milk sample is found to be –0.2°C, while it should have been –0.5°C for pure milk. How much water has been added to pure milk to make the diluted sample ?

(1) 2 cups of water to 3 cups of pure milk

(2) 1 cup of water to 3 cups of pure milk

(3) 3 cups of water to 2 cups of pure milk

(4) 1 cup of water to 2 cups of pure milk

Ans. (3)

25. A solid having density of 9×10^3 kg m^{-3} forms face centred cubic crystals of edge length $200\sqrt{2}$ pm. What is the molar mass of the solid ?

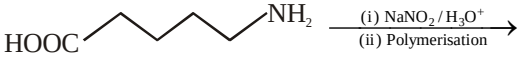
(Avogadro constant $\cong 6 \times 10^{23}$ mol^{-1}, $\pi \cong 3$)

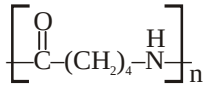
(1) 0.0216 kg mol^{-1} (2) 0.0305 kg mol^{-1}

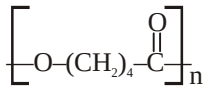
(3) 0.4320 kg mol^{-1} (4) 0.0432 kg mol^{-1}

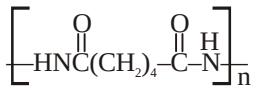
Ans. (2)

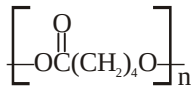
26. The polymer obtained from the following reactions is :



(1) 

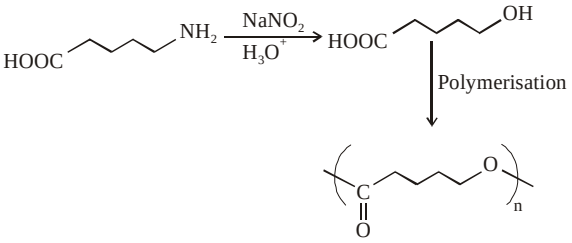
(2) 

(3) 

(4) 

Ans. (2)

Sol.



27. An example of solid sol is :

(1) Butter (2) Gem stones

(3) Paint (4) Hair cream

Ans. (2)

28. Peoxyacetyl nitrate (PAN), an eye irritant is produced by :

(1) Acid rain (2) Photochemical smog

(3) Classical smog (4) Organic waste

Ans. (2)

Sol. Photochemical smog produce chemicals such as formaldehyde, acrolein and peroxyacetyl nitrate (PAN).

29. NaH is an example of :

(1) Electron-rich hydride (2) Molecular hydride

(3) Saline hydride (4) Metallic hydride

Ans. (3)

Sol. NaH is an example of ionic hydride which is also known as saline hydride.

30. The amphoteric hydroxide is :

(1) $Ca(OH)_2$ (2) $Be(OH)_2$

(3) $Sr(OH)_2$ (4) $Mg(OH)_2$

Ans. (2)

Sol. $Be(OH)_2$ is amphoteric in nature while rest all alkaline earth metal hydroxide are basic in nature.